Landsat 9 Project
Briefing to the Landsat Science Team

January 13, 2016

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NASA Goddard Space Flight Center

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USGS Landsat 9 Project Manager
USGS EROS Center

Landsat 9

- **Officially directed to initiate project on March 4, 2015**
- **Strong support from Administration, Congress, NASA, and USGS**
- **Strong team has been assembled by both NASA and USGS**
  - Great mix of Landsat veterans and talented new blood
- **Strong relationship between NASA and USGS continuing directly from Landsat 8 launched 3 years ago**
- **Landsat 9 builds on great performance of Landsat 8**

Landsat 9 Overview

Landsat 9 will continue the Landsat data record by providing multispectral images of the Earth's land surface on a 16-day repeat cycle

- **President's 2016 Budget Request, February 2015**
  - Landsat 9 is to be "a fully Class-B rebuild of Landsat 8"

- **Payloads**
  - Operational Land Imager 2 (OLI-2)
  - Thermal Infrared Sensor 2 (TIRS-2)

- **NASA / USGS Partnership**
  - NASA is responsible for the space segment (Instruments and spacecraft / observatory), launch, and on-orbit checkout
  - USGS will build the ground system, operate the satellite, and handle data processing, archive, and distribution

Landsat 9 Mission Objectives

- **Mission Objectives:**
  - Collect and archive moderate-resolution, reflective and emissive multispectral image data affording seasonal coverage of the global land mass for a period of no less than five years;
  - Ensure that Landsat 9 data are sufficiently consistent with data from the earlier Landsat missions, in terms of acquisition geometry, acquisition rates, calibration, coverage characteristics, spectral and spatial characteristics, output product quality, and data availability to permit studies of land cover and land use change over multi-decadal period;
  - Distribute standard Landsat 9 data products to users on a nondiscriminatory basis and at no cost to the users.

Landsat 9 builds on great performance of Landsat 8, and extends the 40+ year Landsat data archive

Landsat 9 Marching Orders

- **NASA HQ direction: Spring/Summer 2015**
  - Project to begin in Phase A
  - Launch no later than 2023
    - Implement Phase A to *not preclude launch in 2021*
  - Category 1, Risk Class B project
  - Plan for 5 years of mission ops & data analysis post commissioning (Launch plus 90 days)
  - Measurement capabilities consistent with L8 Level 1 requirements
- **NASA HQ amended direction in response to FY16 appropriations and associated congressional language targeting a 2020 launch**
  - **January 2016:** Project has been directed to pursue the earliest possible launch date within the spending authority provided in FY16
  - Project has $100M in Congressionally directed spending authority for FY16: $58M of unspent carryover from FY15, $42M in new FY16 funding
  - Substantial progress in FY16 is required for maintaining CY2020 LRD

Development Plan

- **Instruments**
  - Build TIRS-2 in-house at GSFC (upgrade to Class B)
  - OLI-2 acquisition directed to BATC via sole source process
- **Compete spacecraft w/ observatory I&T via GSFC Rapid Spacecraft Development Office (RSDO)**
- **Compete launch vehicle via NASA Launch Services Program at KSC**
- **USGS to develop Ground System**
  - Compete Mission Operations Center (MOC) at NASA GSFC
  - Upgrade Landsat 8 ground stations at EROS; Fairbanks, AK; and Svalbard, Norway
  - Upgrade Data Processing and Archive System (DPAS) at USGS EROS

Current Status

Project Management

- Project staffing complete for Phase A
- Program Level Requirements Appendix (PLRA) (i.e., level 1 requirements) in signature cycle
- Planning for Mission Definition Review (MDR) in May 2016 to be followed by Key Decision Point B

Spacecraft

- Awarded 4-month studies to five companies on December 18th via RSDO
  - Ball Aerospace, Lockheed Martin, Northrop Grumman, Orbital/ATK, Thales Alenia
  - Study contractors notified this week that project intends to accelerate completion of studies by 6 weeks to enable targeting of earlier LRD
- Project will pursue competitive spacecraft acquisition as quickly as possible, as guided by Program management

Operational Land Imager 2 (OLI-2)

- Ball Aerospace under contract as of December 30, 2015
- Planning Heritage Review in spring and Critical Design Review in summer 2016

Thermal Infrared Sensor 2 (TIRS-2)

- Heritage Review successfully completed on Nov. 19th
- Planning Preliminary Design Review in summer 2016

USGS Current Status

USGS Project Management / Ground System

- Augmenting USGS staff to support Landsat 9 development
  - Positions are in various stages of the hiring process
- Ground System Heritage Review planned for late 2016

Mission Operations Center (MOC)

- Landsat 9 MOC will be at GSFC
- USGS MOC procurement strategy planned to be released later this week

Ground Network Element (GNE)

- Baseline to use/upgrade Landsat 8 ground stations: EROS; Fairbanks, AK; and Svalbard, Norway
- International ground stations are currently being added to Landsat 8 ground network

Data Processing and Archive System (DPAS)

- Core Landsat 9 data processing system based on Landsat 8 system
- Planning multi-mission upgrades to integrate Landsat 1-7 and Landsat 8 data processing system in FY16/FY17 to support Landsat 9 development starting in FY17

Landsat 9 - Project Organization

LANDSAT-9

Project Manager – Del Jenstrom
Deputy Project Manager – Steve Pszcolka
DPM/Resources – Lorrie Eakin
Admin Asst. – Pam Carrick

- **NASA HQ Program Exec –** David Jarrett
- **KSC** – Bruce Reid
- **USGS Landsat Project Mgr –** Jim Nelson

Project Science Office
Project Scientist – Jeff Masek

- **Deputy Proj. Sci. –** Bruce Cook
- **Instrument Scientist –** Phil Dabney
- **TIRS Instrument Scientist –** Dennis Reuter
- **RA –** Ryan Fiora
- **Contractor Support**

Financial Mgr.
Joana Lauderdale

- **RA** – Catherine Lynch
- **RA** – Tennetta Starr

Proj. Support Mgr.
Kelly Catlett

- **Scheduling**– Andy Eaker
- **EVM** – Scott Reynolds
- **CM** – Deb Yoder
- **DM –** Dawn Sierfeld

Chief S&MA Officer –
Syed Aziz

- **Safety –** Steve Leiter
- **Reliability –** Paula Pruessner
- **Parts & Radiation Assurance –** Miguel Moe
- **Materials & Processes Assurance–** TBD
- **Project QA – TBD**
- **QA OLI-2 On-Site –** Cathy Yonts/Bart Cosart
- **QA S/C On-Site –** TBD
- **QA S/W –** Isaac McGinnis/ Jennifer Parnell

Discipline Engineering

- **GNC/ACS** – Sam Placanica
- **Propulsion** – Ashley Scroggins
- **Mechanical** – Dan Helfrich
- **Structures** – Ryan Simmons
- **Electromechanical** – Alissa Mitchell
- **Thermal** – Rick Stavely
- **C&DH** – Ed Brinker
- **EMI/EMC** – Fred Blanchette
- **RF Comm** – Victor Sank
- **Power –** Chetty Pandipati
- **Focal Plane** – Sachi Babu
- **Optics –** Gene Waluschka

Acting Procurement Mgr.
Ayana Briscoe
S/C CO – TBD
OLI-2 CO (temp)– Michael Nguyen

Communications and Public Engagement

- Rani Gran
- Jen Brill

Mission System Engineering
Evan Webb - Systems Manager & TA

- **Deputy Sys. Mgr. –** Steve Aloezos
- **Verification** –
- **Observatory I/F SE –** Ted Grems
- **Spacecraft SE** – Angela Russo
- **Flight Software Mgr.** – Jay Sigrist
- **Electrical SE –** Terry Sullivan
- **Jitter –**Alice Liu
- **Simulator Lead –**
- **FPGA Verification** – Chris Dailey
- **Contamination –** Mark Secunda
- **Ground SE**–
- **Risk Manager –** Tim Dudenhoefer
- **TIRS-2 I/F Eng.** – Mike Pryzby
- **Reqts. Mgmt.** – Judy Brannen/Joseph Dress
- **Orbital Debris –** Ivonne Rodriguez
- **Space Charging –** Bob Meloy
- **Fault Management –** Terry Ford
- **Flight Dynamics/FDF –** Laurie Mann
- **Materials & Processes –** Mike Beamesderfer
- **EEE Parts –** Rich Williams/ Patrick Dugan
- **Radiation –** Mike Campola

USGS Representatives

- **USGS Chief Eng. –**
- **USGS Sys. Eng. –** Jason Williams

Obs Mgr
Vicki Dulski

- **Assistant –** Phil Sabelhaus
- **On-Site Rep –**
- **AETD Disc. Engrs**

Cal/Val Mgr
Brian Markham

- **USGS Lead** – Ron Morfitt
- **USGS Geom. Lead** - James Storey
- **Cal/Val Team**

OLI-2 Inst. Mgr
Matt Strube

- **DIM –** Param Nair
- **ISE –**
- **On-Site Rep –** Jeff Pedelty
- **AETD Disc. Engrs**

TIRS-2 Inst. PM
Jason Hair/490

- **DIPM –** Bob Caffrey
- **FM –** Lateef Ajayi
- **ISE –** Steve Graham
- **CSO –** Belkacem Manseur
- **AETD Disc. Engrs**

LV I/F Mgr

Mission Ops Readiness Mgr
Carlos Gomez-Rosa

- **NASA Ground Lead –**
- **MRT Lead –**
- **Sim/Rehearsal Lead –**
- **FSTL –**

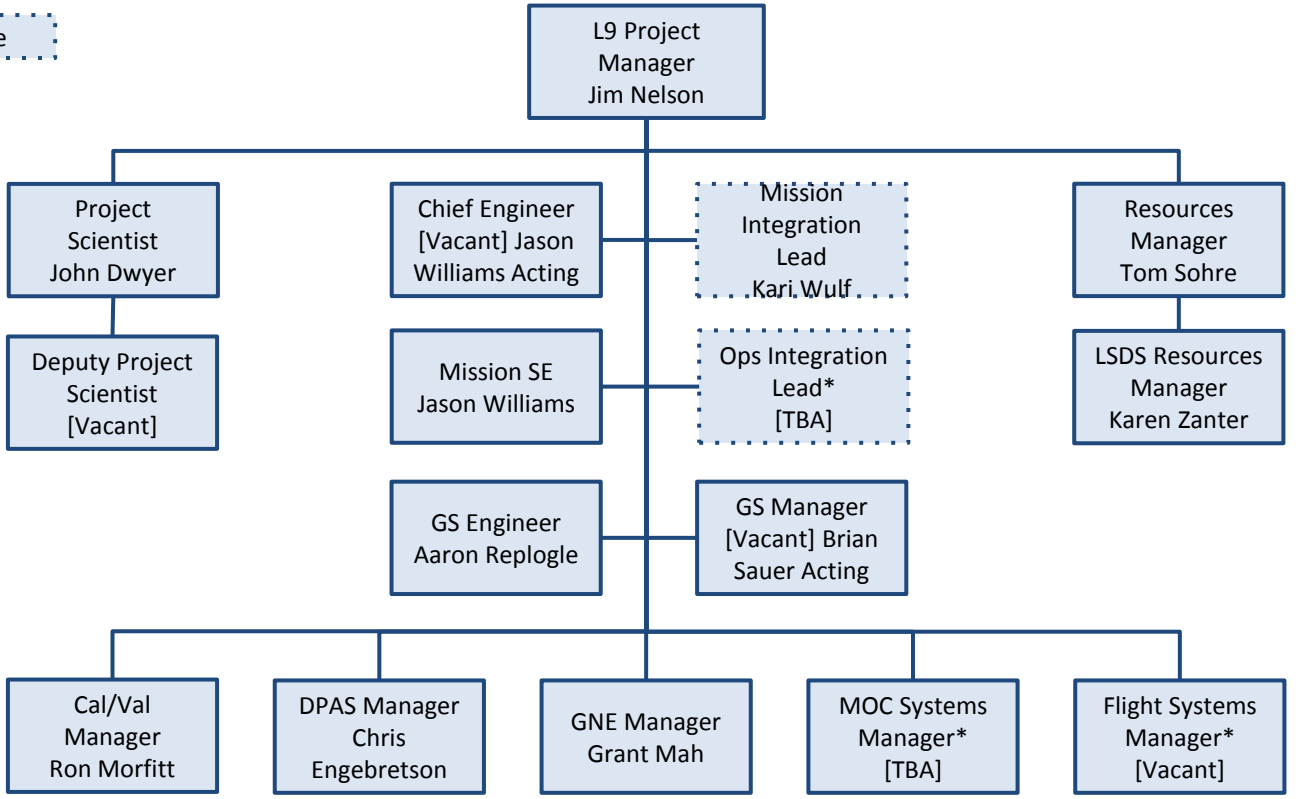
USGS Representatives

- **USGS FSM –** TBD
- **USGS FOT**
- **USGS GS Mgr –** TBD
- **USGS GS Int. Lead –**
- **USGS MOC Lead –**

USGS Landsat 9 Project Organization

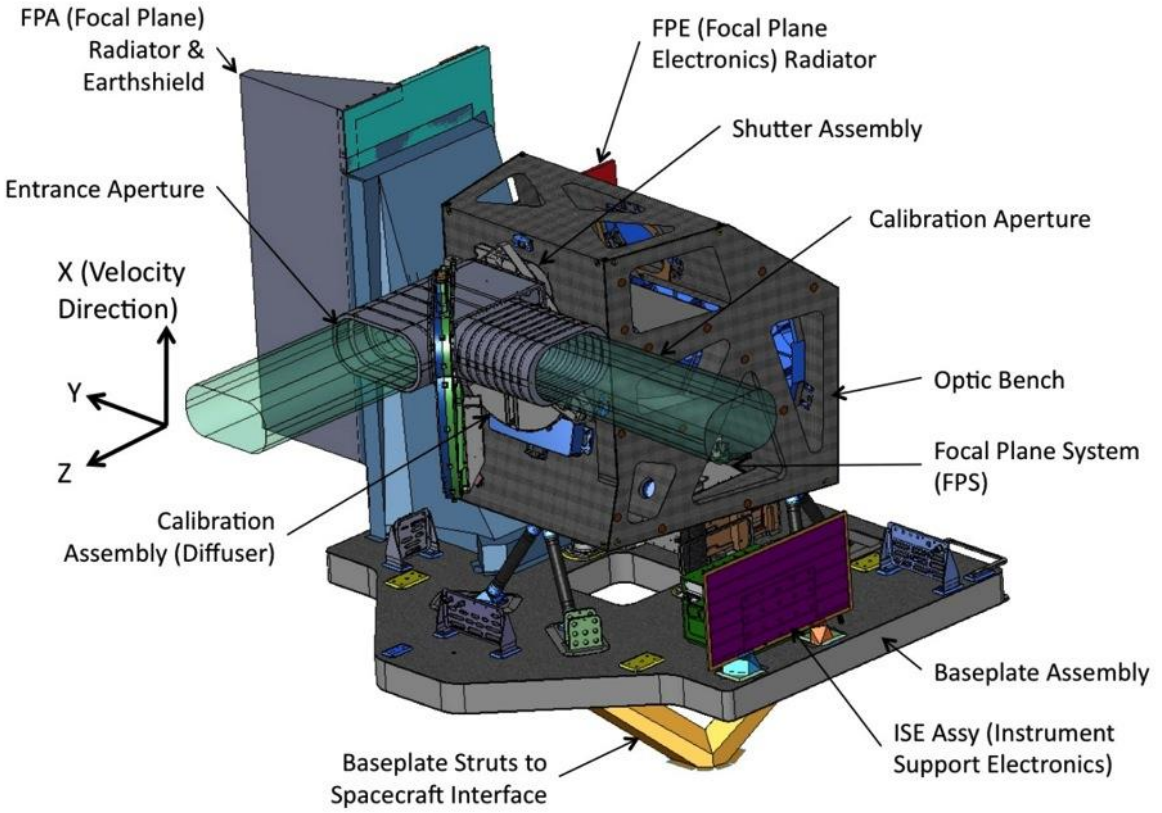
* on-site at GSFC

Aerospace



Operational Land Imager 2 (OLI-2)

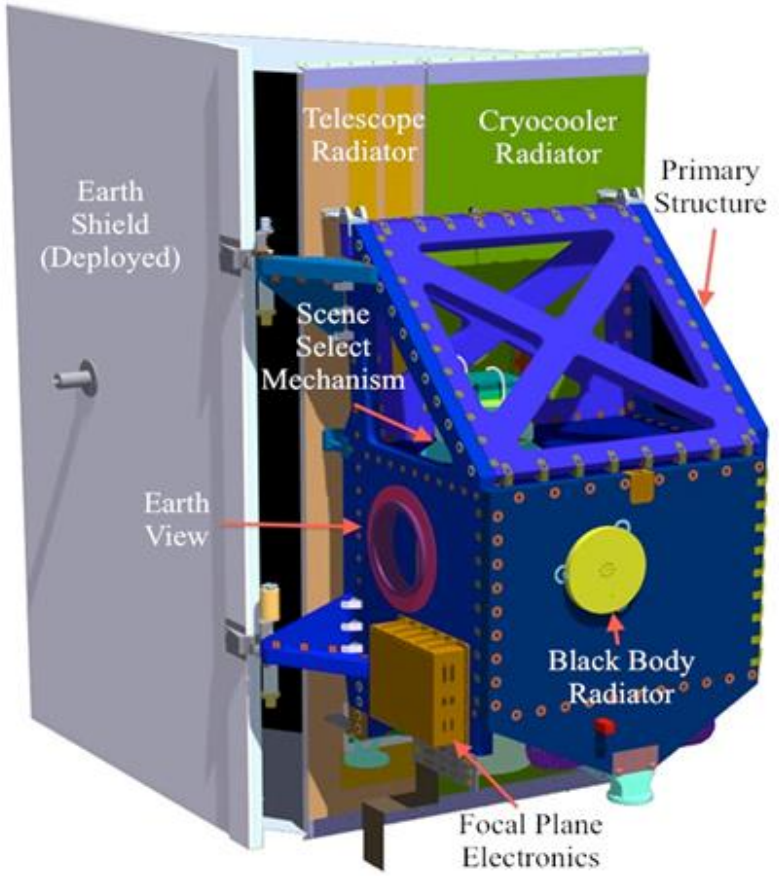
OLI-2 will, to the extent possible, be a copy of OLI for Landsat 9 to maintain data continuity with Landsat 8 and to minimize cost and risk



Assembled LDCM OLI at vendor's facility

Thermal Infrared Sensor 2 (TIRS-2)

TIRS-2 will be a rebuild of Landsat 8 TIRS except TIRS-2 will be upgraded to Risk Class B for Landsat 9



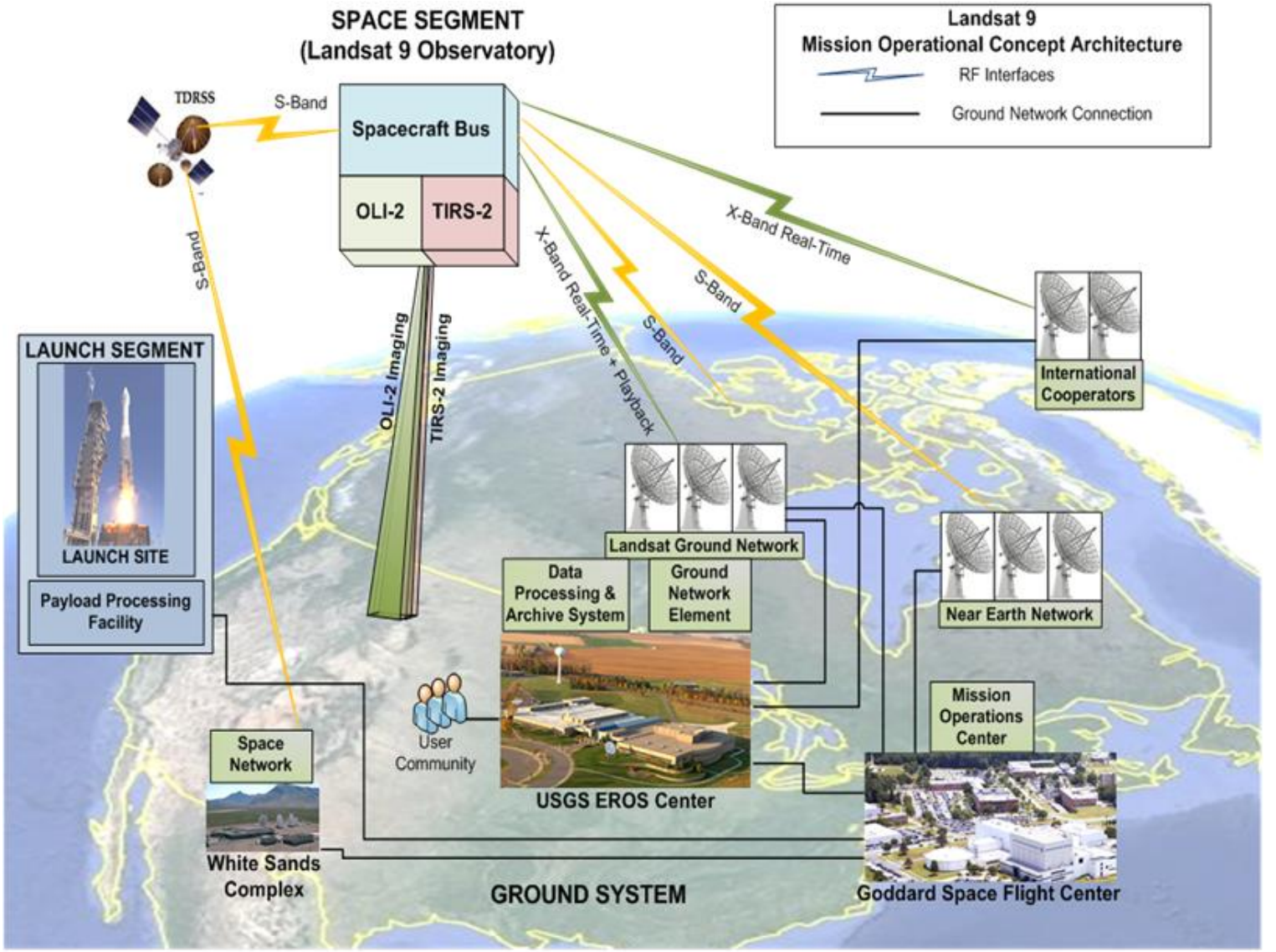
NOTE: TIRS-2 MEBs, CCEs and RSE are mounted on the spacecraft and not shown in figure

- **Primary Risk Class B Improvements**
  - Redundant Main Electronics Boxes (MEBs)
  - Redundant Cryocooler Electronics (CCEs)
  - Redundant Switch Electronics (RSEs)

Other TIRS-2 Improvements

- Improved stray light performance through improved telescope baffling
- Improved position encoder for scene select mirror to address problematic encoder on Landsat 8 TIRS
- Improved thermal blanketing to better protect from micrometeorite impact; in accordance with new GSFC guidelines

Landsat 9 Operations Concept Architecture



Wrap-Up

- **Landsat 9 project is fully staffed and moving out quickly**
- **TIRS-2 and OLI-2 instruments are underway**
- **Spacecraft acquisition is in a competitive study phase**
  - Project responding to recent HQ direction to target earliest possible launch date
- **Acquisition of launch services and development of ground/ops systems will take place to support directed LRD**
- **Project planning to complete several key milestones in 2016**
  - Mission Definition Review and Key Decision Point B (KDP-B)
  - TIRS-2 Preliminary Design Review
  - OLI-2 Heritage Review and Critical Design Review
  - Ground System Heritage Review